U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2025 Semester End Main Examinations

Programme: B.E. **Semester: I / II**
Branch: Common to all Branches **Duration: 3 hrs.**
Course Code: 21CY1BSECT / 21CY2BSECT **Max Marks: 100**
Course: Engineering Chemistry

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	What are reference electrodes? Describe the construction and working of calomel electrode with a neat diagram.	1	1	**7**
	b)	Describe the anodization of aluminum and mention its significance.	1	1	**7**
	c)	What is electroless plating? Explain the electroless plating of copper with relevant reactions.	1	1	**6**
		OR			
2	a)	Define corrosion. Describe the electrochemical theory of corrosion with relevant reactions.	1	1	**7**
	b)	Predict the effect of following factors on the rate of corrosion i) temperature (ii) pH of the medium (iii) humidity.	2	1	**7**
	c)	Apprise the process of galvanization of iron.	1	1	**6**
		UNIT – II			
3	a)	Define GCV and NCV. When 0.65 g of chemical fuel is subjected to complete combustion in a bomb calorimeter, the temperature of surrounding water increased from 24.8^{o}C to 27. 6^{o}C. The weight of water taken and water equivalent of calorimeter were 1.9 kg and 0.45 kg respectively. Calculate GCV and NCV of the fuel. (Given: Specific heat of water = 4.186 kJ/kg/^{o}C, Latent heat of steam is 2457 kJ/kg) and percentage of hydrogen in the fuel is 4.9.	2	1	**7**
	b)	Explain the construction and working of PV cell.	1	1	**7**
	c)	Describe the construction and working of Li-CoO_2 battery. Write any two applications of Li-CoO_2 battery.	1	1	**6**
		OR			
4	a)	What is cracking? Justify its need and elaborate on fluidized bed catalytic cracking.	1	1	**7**
	b)	Describe the concept of engine knocking. How is it related to chemical structure of gasoline?	1	1	**7**
	c)	Outline the construction and working of Methanol-oxygen fuel cell.	1	1	**6**

			UNIT – III			
	5	a)	Define Tg of a polymer. Discuss the influence of intermolecular forces and crystallinity of a polymer on Tg.	1	1	**7**
		b)	What are biodegradable polymers? Describe the synthesis and applications of polyglycolic acid.	1	1	**7**
		c)	In a polymer sample, 25 molecules have molecular mass 15000g/mol, 30 molecules have molecular mass 25000 g/mol and 45 molecules have molecular mass 20000 g/mol. Calculate the number average and weight average molecular mass of the polymer. Calculate PDI of the polymer.	2	1	**6**
			OR			
	6	a)	Outline the synthesis of i) PMMA and ii) Nitrile rubber.	2	1	**7**
		b)	Describe the synthesis and application of Kevlar.	2	1	**7**
		c)	List the criteria for a polymer to behave as conducting polymer. Explain the mechanism of conduction in polyaniline by oxidative doping.	2	1	**6**
			UNIT – IV			
	7	a)	List any five principles of green chemistry.	4	7	**7**
		b)	Mention the disadvantages of hard water. Calculate total, permanent and temporary hardness of water sample. If 40 cm^3 of hard water sample was required 16 cm^3 of 0.025 M EDTA salt solution. The same amount of hard water sample of after boiling and filtering required 11.5 cm^3 of the same EDTA solution with the experimental procedure.	4	7	**7**
		c)	Elaborate on the desalination of sea water by electrodialysis method.	2	1	**6**
			OR			
	8	a)	Outline the synthesis of paracetamol by green route. Mention its application.	4	7	**7**
		b)	Define COD. 25 cm^3 of waste water sample was mixed with acidified $K_2Cr_2O_7$. The unreacted $K_2Cr_2O_7$ required 10 mL of 0.15 N FAS. In a blank titration 25 mL of acidified $K_2Cr_2O_7$ required 16 mL of same 0.15 N FAS. Calculate the COD of the waste water sample.	2	1	**7**
		c)	Describe the process of removal of hardness by ion exchange method with a neat diagram.	1	1	**6**
			UNIT – V			
	9	a)	Sketch and explain the phase diagram of Pb-Ag system.	4	7	**7**
		b)	List the properties and applications of graphene and carbon nanotubes (CNTs).	1	1	**7**
		c)	Explain the principle and procedure involved in estimation of sodium using flame photometry.	4	7	**6**
			OR			
	10	a)	State Gibb's phase rule. Draw and explain the phase diagram for water system.	2	1	**7**
		b)	Describe the synthesis of nanomaterials by sol-gel method with an example.	1	1	**7**
		c)	State Lambert – Beer Law. Elaborate the principle involved in copper colorimetric estimation.	4	7	**6**

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